

FIG. 5A
Alcaligenes (Deleya) aquamarinus Catalase - 64CA2
 (SEQ ID NO: 5)
 (SEQ ID NO: 6)

1 ATG AAT AAC GCA TCC GCT GAC GAT CTA CAC AGT CTC CAG CAA AGA TGC AGA GCA TTT 60
 Met Asn Ala Ser Ala Asp Asp Leu His Ser Ser Leu Gln Gln Arg Cys Arg Ala Phe 20
 61 GTT CCC TTG GTA TCG CCA AGG CAT AGA GCA ATA AGG GAG AGA GCT ATG AGC GGT AAA TGT 120
 Val Pro Leu Val Ser Pro Arg His Arg Ala Ile Arg Glu Arg Ala Met Ser Gln Lys Cys 40
 121 CCT GTC ATG CAC GGT AAC ACC TCG ACC GGT ACT TCC AAC AAA GAT TGG TGC CCG GAA 180
 Pro Val Met His Gly Gly Asn Thr Ser Thr Gly Thr Ser Asn Lys Asp Thr Pro Glu 60
 181 GGG TTG AAC CTG GAT ATT TTG CAT CAG CAA GAT CGC AAA TCA GAC CCG ATG GAT CCG GAT 240
 Gly Leu Asn Leu Asp Ile Leu His Gln Gln Asp Arg Lys Ser Asp Pro Met Asp Pro Asp 80
 241 TTC AAC TAC CGT GAA GAA GTA CGC AAG CTC GAT TTC GAC GCG CTG AAG AAA GAT GTC CAC 300
 Phe Asn Tyr Arg Glu Val Glu Val Arg Lys Leu Asp Phe Asp Ala Leu Lys Asp Val His 100
 301 GCG TTG ATG ACC GAT AGC CAA GAG TGG TGG CCC GCT GAC TGG GGG CAC TAC GGC GGT TTG 360
 361 301 Ala Leu Met Thr Asp Ser Gln Glu Trp Ile Pro Ala Asp Trp Gly His Tyr GLY GLY Ileu 120
 Met Ile Arg Met Ala Trp His Ser Ala Gly Thr Tyr Arg Ile Ala Asp Gly Arg Gly Arg 140
 421 GGT GGT ACC GGA AGC CAG CGC TTT GCA CCG CTC AAC TCC TGG CCG GAC AAC GTC AGC CTG 480
 141 Gly Gly Thr Gly Ser Gln Arg Phe Ala Pro Leu Asn Ser Trp Pro Asp Asn Val Ser Leu 160
 481 GAT AAA GCG CGC CGT CTG CTG TGG CCG ATC AAG AAG TAC GGC AAC AAA ATC AGC TGG 540
 161 Asp Lys Ala Arg Arg Leu Trp Pro Ile Lys Lys Tyr GLY Asn Lys Ile Ser Trp 180
 541 GCA GAC CTC ATG ATT CTG GCT GGC ACC GTC CCT ATT GAG TCC ATG GGC TTA CCT GCT TAC 600
 181 541 Ala Asp Leu Met Ile Leu Ala Gly Thr Val Ala Tyr Glu Ser Met Gly Leu Pro Ala Tyr 200
 601 GGC TTC TCT TCT GTC GTC GGC CGC GTC GAT ATT TGG GAA CCC GAA AAA GAT ATC TAC TGG GGT GAC 660
 201 Gly Phe Ser Phe Gly Arg Val Asp Ile Trp Glu Pro Glu Lys Asp Ile Tyr Trp Gly Asp 220

FIG 5B

621 GAA AAA GAG TGG CTG GCA CCT CCT GAC GAA CGG TAC GGC GAC GTG AAC CCA GAG CCA GAG ACC 720
 621 Glu Lys Glu Trp Leu Ala Pro Ser Asp Glu Arg Tyr Glu Asp Val Asn Lys Pro Glu Thr 240
 721 ATG GAA AAC CCG CTG GCG GCT GTC CAA ATG GGT CTG ATC TAT GTG AAC CCG GAA GGT GTT 780
 721 Met Glu Asn Pro Leu Ala Ala Val Gln Met Gly Leu Thr Tyr Val Asn Pro Glu Glu Val 260
 781 AAC GGC CAC CCT GAT CCG CTG AGA ACC GCA CAG CAG GTA CTT GAA ACC TTC GCC CGT ATG 840
 781 Asn Glu His Pro Asp Pro Leu Arg Thr Ala Gln Val Gln Val Leu Glu Thr Phe Ala Arg Met 280
 841 GCG ATG AAC GAC GAA AAA ACC GCA GGC CTC ACA GCT GGC GGC CAC ACC GTC GGT AAT TGT 900
 841 Ala Met Asn Asp Glu Lys Thr Ala Ala Leu Thr Ala Glu Glu His Thr Val Glu Asn Cys 300
 901 CAC GGT AAT GGC AAT GGC TCT GCG TTA GCC CCT GAC CCA AAA GCC TCT GAC GTT GAA AAC 960
 901 His Glu Asn Glu Asn Ala Ser Ala Leu Ala Pro Asp Pro Lys Ala Ser Asp Val Glu Asn 320
 961 CAG GGC TTA GGT TGG GGC AAC CCC AAC ATG CAG GGC AAG GCA AGC AAC GCC GTG ACC TCG 1020
 961 Gln Glu Leu Glu Trp Glu Asn Pro Asn Met Gln Glu Lys Ala Ser Asn Ala Val Thr Ser 340
 1021 GGT ATC GAA GGT GCT TGG ACC ACC AAC CCC ACG AAA TTC GAT ATG GGC TAT TTC GAC CTG 1080
 1021 Gly Thr Glu Glu Ala Trp Thr Thr Asn Pro Thr Lys Phe Asp Met Glu Tyr Phe Asp Leu 360
 1081 CTG TTC GGC TAC AAT TGG GAA CTC AAA AAG AGT CCT GCC GGT GCC CAC CAT TGG GAA CCG 1140
 1081 Leu Phe Glu Tyr Asn Trp Glu Leu Lys Ser Pro Ala Glu Ala His His Trp Glu Pro 380
 1141 ATT GAC ATC AAA AAG GAA AAC AAG CCG GTT GAC GAC CCC TCT ATT CGC CAC AAC 1200
 1141 Thr Asp Thr Lys Lys Glu Asn Lys Pro Val Asp Ser Asp Pro Ser Thr Arg His Asn 400
 1201 CCG ATC ATG ACC GAT GCG GAT ATG GCG ATA AAC GTA AAT CCG ACC TAT CGC GCT ATC TGC 1260
 1201 Pro Thr Met Thr Asp Ala Asp Met Ala Asn Val Asn Pro Thr Tyr Arg Ala Thr Cys 420
 1261 GAA AAA TTC ATG GCC GAT CCT GAG TAC TAC TTC AAG AAA ACT TTC GCG AAG GCG TGG TTC AAG 1320
 1261 Glu Lys Phe Met Ala Asp Pro Glu Tyr Phe Lys Lys Ala Trp Phe Lys 440
 1321 CTG ACG CAC CGT GAC CTG GGC CCC AAA TCA CGT TAC ATC CGC CCG GCA GAA 1380
 1321 Leu Thr His Arg Asp Pro Leu Glu Pro Lys Ser Arg Tyr Thr Glu Val Pro Ala Glu 460

FIG. 5C

1381 GAC CTG ATT TCG CAA GAC CCG ATT CCG GCA GGT AAC ACC GAC TAC TGC GAA GAA GTC GTC 1440
 1461 Asp Leu Ile Trp Gin Asp Pro Ile Pro Ala Gly Asn Thr Asp Tyr Cys Glu Val Val 1480
 1481 Lys Gin Lys Ile Ala Gin Ser Gly Leu Ser Ile Ser Gly Leu Met Val Ser Thr Ala Trp Asp 1500
 1501 ACT GCC CGT ACT TAT CGC GGT TCC GAT ATG CGC CGC GGT GCT AAC GGT GCC CGC ATT CGC 1560
 1521 Ser Ala Arg Thr Tyr Arg Gly Ser Asp Met Arg Gly Ala Asn Gly Ala Arg Thr Arg 520
 1561 TTG GCC CCA CAG AAC GAG TGG CAG GGC AAC GAG CCG CGC CTC GCG AAA GGT GCTG AGC 1620
 1621 Leu Ala Pro Gin Asn Glu Trp Gin Gly Asn Glu Pro Glu Arg Leu Ala Lys Val Leu Ser 540
 1642 Val Tyr Glu CAG ATC TCT TCT GCC GAC ACC GGC GCT AGC ATC GCG GAC GTG ATC GTT CTG GCC 1680
 1661 GGT AGC GTC GGC ATC GAG AAA GCG CCG AAA GCA GCA GGT TAC GAT GTG CGC GTT CCC TTC 1740
 1681 Leu Lys Gly Ser Val Gly Ile Ser Ala Asp Thr Gly Ala Ser Ile Ala Asp Val Arg Val Arg 560
 1701 CTG AAA GGC CGT GGC GAT GCG ACC GCC GAG ATC ACC GCA GCA GAC TCC TTC GCA CCG CTG 1800
 1741 Leu Lys Gly Arg Gly Asp Ala Thr Ala Glu Met Thr Asp Ala Asp Ser Phe Ala Pro Leu 600
 1781 Glu Pro Leu Ala Asp Gly Phe Arg Asn Trp Gin Lys Lys Glu Tyr Val Val Lys Pro Glu 620
 1801 GAG CCG CTG GCC GAT GGC TTC CGC AAC TGG CAG AAG AAA GAG TAT GTG GTG AAG CCG GAA 1860
 1861 GAG ATG CTG CTG GAT CGT GCG CAG CTG ATG GGC TTA ACC GGC CCG GAA ATG ACC GTG CTG 1920
 1881 Trp Lys Pro Val Gly Ser Asn Ala Tyr Glu Ile Arg Asp Arg Lys Thr Gly Ala Val Lys 700
 1921 CTG GGC GGT ATG CGC GTC ATT GGC ACC AAC TAT GGT GGC ACC AAA CAC GGC GTC ATT ACC 1980
 1941 Leu Gly Met Arg Val Leu Gly Thr Asn Tyr Gly Gly Thr Lys His Gly Val Phe Thr 660
 1981 GAT TGT GAA GCA GGC CAG TTG ACC AAC GAC TTT GTG AAC CTG ACC GAT ATG GGG AAC AGC 2040
 2001 TGG AAG CCC GTA GGT AGC AAC GCC TAC GAA ATC CGC GAC CGC AAG ACC GGT GTC GAG 2100

FIG. 5D

2101 TGG ACC GCC TCG CGG GTG GAT CTG GTA TTT GGT TCC AAC TCC TCG CTC CGC TCT TAC GCA 2160
701 Trp Thr Ala Ser Arg Val Asp Leu Val Phe Gly Ser Asn Ser Tyr Arg Ser Tyr Ala 720
2161 GAA GTG TAC GCC CAG GAC GAT AAC GGC GAG AAG TTC GTC AGA GAC TTC GTC GCC GGC TGG 2220
721 Glu Val Tyr Ala Gln Asp Asp Asn Gly Glu Lys Phe Val Arg Asp Phe Val Ala Ala Trp 740
2221 ACC AAA GTG ATG AAC GCC GAC CGT TTC GAC GTC GCG TCG TAA 2262
741 Thr Lys Val Met Asn Ala Asp Arg Phe Asp Val Ala Ser End

FIG. 6A
***Microscilla furvescens* Catalase - 53CA1**

(SEQ ID NO: 7)
 (SEQ ID NO: 8)

1 ATG GAA AAT CAC AAA CAC TCA GGA TCT TCT ACC TAT AAC ACA AAC ACT GGC GGA AAA TGC
 Met Glu Asn His Lys His Ser Gly Ser Thr Tyr Asn Ser Gly Thr Asn Thr Gly Lys Cys 28
 61 CCT TTT ACC GGA GGT TCG CTT AAG CAA AGT GCA GGT GGC GGC ACC AAA AAC AGG GAT TGG 120
 Pro Phe Thr Gly Ser Leu Lys Gln Ser Ala Gly Gly Gly Thr Lys Asn Arg Asp Trp 140
 121 TGG CCC AAC ATG CTC AAC CTC ATC TTA CGC CAA CAT TCA TCG CTA TCG GAC CCA AAC 180
 Trp Pro Asn Met Leu Asn Leu Gly Thr Leu Arg Gln His Ser Ser Leu Ser Asp Pro Asn 60
 181 GAC CCG GAT TTT GAC TAT GCC GAA GAG TTT AAG AAG CTA GAT CTG GCA GCG GTT AAA AAG 240
 Asp Pro Asp Phe Asp Tyr Ala Glu Phe Lys Leu Asp Leu Lys Leu Asp Leu Ala Val Lys Lys 80
 241 GAC CTG GCA GCC CTA ATG ACA GAT TCA CAG GAC TGG TGG CCA GCA GAT TAC GGT CAT TAT 300
 Asp Leu Ala Ala Leu Met Thr Asp Ser Gln Asp Trp Trp Pro Ala Asp Tyr Gly His Tyr 100
 301 GGG CCC TTC TTT ATA CGC ATG GCG TGG CAC AGC GGC ACC TAC CGT ATC GGT GAT GGC 360
 Gly Pro Phe Phe Thr Ala Arg Met Ala Trp His Ser Ala Gly Thr Tyr Arg Thr Gly Asp Gly 120
 361 CGT GGT GGC TCC GGC TCA CAG CCG TTC GCG CCT CTC AAT AGC TGG CCA GAC AAT 420
 121 Arg Gly Gly Ser Gly Ser Gln Arg Phe Ala Pro Leu Asn Ser Trp Pro Asp Asn 140
 421 GCC AAT CTG GAT AAA GCA CGC TTG CTT CTT TGG CCC ATC AAA CAA CAA AAA TAC GGT CGA AAA 480
 141 Ala Asn Leu Asp Lys Ala Arg Leu Leu Leu Trp Pro Ile Lys Gln Lys Tyr Gly Arg Lys 160
 481 ATC TCC TGG GCG GAT CTA ATG ATA CTC ACA GGA AAC GTC GCT CTG GAA ACT ATG GGC TTT 540
 161 Thr Ser Trp Ala Asp Leu Met Ile Leu Thr Gly Asn Val Ala Leu Glu Thr Met Gly Phe 180
 541 AAA ACT TTT GGT TTT GCA GGT GGC AGA GCA GAT GTC TGG GAG CCT GAA GAA GAT GTA TAC 600
 181 Lys Thr Phe Gly Phe Ala Gly Arg Ala Asp Val Trp Glu Pro Glu Glu Asp Val Tyr 200
 601 TGG GGA GCA GAA ACC GAA TGG CTG GGA GAC AAG CGC TAT GAA GGT GAC CGA GAG CTC GAA 660
 201 Trp Gly Ala Glu Thr Glu Trp Leu Gly Asp Lys Arg Tyr Glu Asp Arg Glu Leu Glu 220

FIG. 6B

FIG. 6C

1381 GAA GGC CTA AAA GCC AAA ATC CTC GAA TCG GAA CTC GGA CTC ACG GTA AGC GAG CTC GTA AGC ACG 1440
 1461 Glu Gly Leu Lys Ala Lys Ile Leu Glu Ser Gly Leu Thr Val Ser Gly Leu Val Ser Thr 480
 1441 GCA TGG GCT TCT GCA TCT ACT TTT AGA AAC TCT GAC AAC CGG GGT GCC AAC GGT GCA 1500
 1481 Ala Trp Ala Ser Ala Ser Thr Phe Arg Asn Ser Asp Lys Arg Gly Ile Asn Gly Ala Asn Gly Ala 500
 1501 CGT ATA CGA CTC GCC CCA CAA AAA GAC TGG GAA GTA AAC AAC CCT CAG CAA CTT GCC AGG 1560
 1521 Val Leu Lys Thr Leu Glu Gly Ile Glu Gly Asp Phe Asn Gln Ala Gln Ser Asp Asn Lys 540
 1561 GTA CTC AAA ACA CTA GAA GGT ATC CAG GAC TTT AAC CAG GCG CAA TCA GAT AAC AAA 1620
 1581 Lys Asp Ala Gln Lys Pro Gln Lys Asp Trp Glu Val Asn Asn Pro Gln Gln Leu Ala Arg 520
 1621 GCA GTA TCG TTG GCC GAC CTC ATT GTG CTC GCC GGC TGT GCG GGT GTA GAA AAA GCT GCA 1680
 1641 Ala Val Ser Leu Ala Asp Leu Ile Val Leu Ala Gln Cys Ala Gln Cys Ala Gln Val Glu Lys Ala Ala 560
 1681 AAA GAT GCT GGC CAT GAG GTG CAG GTG CCT TTC AAC CCG GGA CGA GCG GAT GCC ACC GCT 1740
 1741 Lys Asp Ala Gly His Glu Val Gln Val Pro Phe Asn Pro Gly Arg Ala Asp Ala Thr Ala 580
 1741 GAG CAA ACC GAT GTG GAA GCT TTC GAA GCA CTA GAG CCA GCG GCT GAC GGC TTT AGA AAC 1800
 1781 Glu Gln Thr Asp Val Glu Ala Phe Glu Ala Leu Glu Pro Ala Asp Gly Phe Arg Asn 600
 1801 TAC ATT AAA CCG GAG CAT AAA GTA TCC GCT GAG GAA ATG CTC GTA GAC CGG GCG CAG CTC 1860
 1801 Tyr Ile Lys Pro Glu His Lys Val Ser Ala Glu Glu Met Leu Val Asp Arg Ala Gln Leu 620
 1861 CTG TCG CTC TCG GCA CCA GAA ATG ACT GCT TTG GTA GGC GGT ATG CGT GTA CTG GGC ACC ACC 1920
 1881 Leu Ser Leu Ser Ala Pro Glu Met Thr Ala Leu Val Gly Gly Met Arg Val Leu Gly Thr 640
 1921 AAC TAC GAC GGT TCG CAG CAT GGA GTG TTT ACA AAT AAG CCG GGT CAG CTA TCC AAT GAC 1980
 1921 Asn Tyr Asp Gly Ser Gln His Gly Val Phe Thr Asn Lys Pro Gly Gln Leu Ser Asn Asp 660
 1981 TTC TTT GTA AAC CTC GAC CTC AAC ACT AAA TGG CGA GCC AGC GAT GAA TCA GAC AAA 2040
 1981 Phe Phe Val Asn Leu Leu Asp Leu Asn Thr Lys Trp Arg Ala Ser Asp Glu Ser Asp Lys 680
 2041 GTT TTT GAA GCC AGA GAC TTC AAA ACT GGC ACC CGG GTA GAC 2100
 2041 Val Phe Glu Gly Arg Asp Phe Lys Thr Gly Glu Val Lys Trp Ser Gly Val Arg Val Asp 700

FIG. 6D

2181 CTG ATC TTC GGA AAT TCC GAG CTA AGA GCA GAA GTG TAC GGC TGT GCA GAT 2180
781 Leu Ile Phe Glu Ser Asn Ser Glu Leu Arg Ala Leu Ala Glu Val Tyr Glu Cys Ala Asp 780
2161 TCT GAA GAA AAG TTT GTG AAA GAT TTT GTG AAG GCC TGG GCA AAA GTA ATG GAC CTG GAC 2220
721 Ser Glu Glu Lys Phe Val Lys Asp Phe Val Lys Ala Trp Ala Lys Val Met Asp Leu Asp 748
2221 CGG TTT GAT CTG AAA TAA 2238
741 Arg Phe Asp Leu Lys End 746